Spectroscopic Characterization of the Artificial Siderophore Pyridinochelin

Michael U. Kumke[a,*], Carsten Dosche[b], Roman Flehr[a],
Wolfram Trowitzsch-Kienast[c], and Hans-Gerd Löhmannsröben[a]

[a] Institute of Chemistry, University of Potsdam, Karl-Liebknecht-Str. 24–25,
D-14476 Potsdam-Golm, Germany. E-mail: Kumke@chem.uni-potsdam.de
[b] Institute of Physics, University of Potsdam, Am Neuen Palais 10, D-14469 Potsdam, Germany
[c] Technische Fachhochschule Berlin, FB II, Luxemburger Str. 10, D-13353 Berlin, Germany

* Author for correspondence and reprint requests

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Siderophores play a very important role in the uptake process of iron by bacteria. Due to the so-called active transport the uptake of siderophores by bacteria is very specific, which makes the use of siderophores as effective shuttles for antibiotics in the treatment of infections and other diseases caused by bacteria highly attractive. In order to further investigate the transport and incorporation of siderophores into the bacteria cells, distinct molecular probes are needed. Especially artificial siderophores, that show a specific intrinsic fluorescence, are highly attractive for such monitoring purposes. A promising candidate of such a fluorescent artificial siderophore is bis-2,3-dihydroxybenzoyl-2,6-dimethylamino-pyridine (pyridinochelin, PY).

The fluorescence properties of PY were investigated in different solvents and in the presence of different metal ions. It was found that PY in its free form shows a complex fluorescence behavior. In methanol a clear dual fluorescence is observed. In aqueous solution intermolecular interactions with water molecules are determining the intrinsic fluorescence. Upon complexation with metal ions ($Me^{3+} = Eu^{3+}$, Tb^{3+}, Al^{3+}, Fe^{3+}) the fluorescence characteristics changed. The fluorescence quantum yield of PY decreased upon addition of Me^{3+} – except for Al^{3+}, which showed no fluorescence quenching. The fluorescence decay of PY loaded with metal ions showed a nicely mono-exponential fluorescence decay, which was in contrast to PY in the absence of metal ions. This drastic change in the fluorescence properties of PY upon metal ion complexation makes PY highly attractive as a fluorescence probe for the investigation of siderophore action and siderophore-mediated transport processes.

Key words: Siderophores, Fluorescence, Excited State Reactions